United States Department of Agriculture
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A DURABLE FLAME-RETARDANT FOR COTTON FABRICS BASED ON A MIXTURE OF THPC AND BAP FORMULATIONS

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An improved flame-retardant treatment for cotton fabrics has been developed at this laboratory. The finish imparted to the fabric is durable to laundering and superior in some respects to previously developed flame-retardants. It consists of a combination of two complementary flame-retardants, both of which were discovered at this laboratory.

The two component flame-retardants are: (1) the THPC flame-retardant, described by W. A. Reeves and J. D. Guthrie in Textile World, 104, 101, 176-182 (1954), and (2) the BAP flame-retardant (made from bromoform and allyl phosphate), described by J. G. Frick, J. W. Weaver, and J. D. Reid in the Textile Research Journal, 25, 100-105 (1955). Both of these flame-retardants impart durable flame-resistance to cotton fabrics, but are not as effective as the combination treatment. The superiority of the combination treatment is particularly marked when a thin strip of fabric, instead of a wider swatch, is ignited at the bottom with a match while being held in a vertical position.

The effect of this treatment on textile properties of the fabric will vary with the weight and construction of the fabric. Some stiffening and loss of tear resistance does occur. In general these effects are barely noticeable.

TYPICAL APPLICATION OF THE THPC-BAP COMBINATION FLAME-RETARDANT TO COTTON FABRIC

The treating bath for the cotton fabric is prepared in the following manner: 286 parts of tetrakis(hydroxymethyl)phosphonium chloride is dissolved in 375 parts of water. Then 54 parts of triethanolamine is added. Urea, 175 parts, is dissolved in 375 parts of water and then 173 parts of trimethylolmelamine is dissolved in this solution. These two solutions are combined and mixed with 810 parts of a 33% BAP emulsion which contains 12 parts of a plasticizer, tetrabutyl thiodisuccinate. The preparation of this emulsion is described in the Textile Research Journal, 25, 100 (1955). This treating bath is stable about 8 hours.

(Contd)

1/ This process is one of several flame-retarding treatments developed by the Agricultural Research Service's Southern Utilization Research Branch in cooperation with and under the sponsorship of the Office of the Quartermaster General.

Cotton fabrics are impregnated with the treating bath on pad rolls using two dips and two nips. About 70% wet add-on is used on fabrics weighing 8 oz. per yard. The fabric is dried, 5 minutes at 100° C (212° F) and cured for 5 minutes at 140° C (284° F), in a vented hot air oven. The fabric is then jig washed and treated with a softening solution before use.

A weight add-on of 18-20% is satisfactory on cotton fabrics 8 oz. per yard or heavier. Lighter fabrics may require a larger add-on.

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